CAT. NO.
26-3256

SPECTACULATOR ™

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Disk Spectaculator™

Table of Contents

Introduction

Spectaculator will turn your Color Computer into a sophisticated calculator and your television into a "worksheet," divided into rows and columns. After entering numbers and formulas, Spectaculator calculates and displays the computed values automatically. One powerful feature of Spectaculator is the ability to recalculate formulas with new numbers you enter.

You can also type headings and labels on the worksheet to give your reports a professional look. With just a few simple keystrokes, you can insert and delete rows and columns of data. An eraser is no longer necessary. Now, you can make error corrections and editing changes automatically. In addition, you'll be able to save all or part of a worksheet on disk for later use. An entire or partial worksheet can be printed.

Use Spectaculator for budgeting and forecasting purposes, statistics, math homework—whatever you can think of. You'll soon find that you're saving not only paper but a lot of valuable time.

Required Equipment

TRS-80 Color Computer equipped with Extended BASIC

Disk Interface and Drive

Optional Equipment

Radio Shack Line Printer VII (or appropriate serial printer)

Additional Disk Drives

Overview

This manual is divided into five sections. Part I will help you get familiar with the computer. Basic terms and concepts unique to the Spectaculator program are introduced.

Part II provides a detailed explanation of each command and the various methods and options you can use. This section outlines the "fine" points and offers remedies if any problems should occur.

Part III is a "sample session," using a step-by-step example. You'll create a simple addition table (using a wide variety of commands) and learn how to save and print a worksheet.

Introduction (continued)

In Part IV, more complicated examples involving budgets, statistics, and geometry are provided. These examples are also stored on the Spectaculator disk so that you can see the finished worksheets on the screen. The advanced sessions include instructions on what formulas to enter and printouts of the worksheets. Part V is a command and key summary for a quick reference.

Part I—Setting Up

First, make sure that the disk system is properly connected to the computer. (If you are going to be using a printer, connect it to the computer now.) Turn on the TV. Next, turn on the computer and disk drives. The screen should show:

```
DISK EXTENDED COLOR BASIC v.r.
COPYRIGHT (C) 1981 BY TANDY
UNDER LICENSE FROM MICROSOFT

OK
```

(v.r. is two numbers specifying which version and which release you have.)

If you do not see this copyright message, turn off the computer, check your connections, and power up again.

Before using Spectaculator, make a Backup copy of the program disk. Refer to the Appendix on page 51 for detailed Format and Backup instructions. The original program disk should only be used to make Backups. Use these Backup copies for day-to-day operations.

Load the Backup copy in Drive Ø and close the drive door. Type:
R U N " D O S " and press ENTER.

In a few seconds, you will see SPEC at the upper left-hand corner of the screen. As the program is being loaded, the red light on the drive door will flash on and off, and soon the screen will show:

```
C > ■
            1        2        3        4
 1 ▄▄▄▄▄▄▄▄▄
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
```

This is just a small portion of a "worksheet" on which you can enter data. A worksheet can contain up to 99 columns and 99 rows. A column can contain from 1 up to 27 characters.

Adjust the color on your TV, so the background is green and the rectangular box at Cell 1,1 (Row 1, Column 1) is black. The box after C> (the Command mode prompt) is called a cursor. You enter commands and data on this prompt line. The black rectangle is called the entry marker. After data is entered, it is displayed in the cell where the entry marker is positioned.

In command mode, you tell the computer which command you want to use. Type ⌨?⌨ to see the first page of the list of commands. (To type uppercase characters, use the ⌨SHIFT⌨ key as you would on a regular typewriter. In this case, press ⌨SHIFT⌨⌨/⌨ to type a question mark.)

The screen shows:

```
C>
    SPECTACULATOR COMMAND SET

    MM—MOVE MARKER
    EN—ENTER NUMBERS
    CF—COLUMN FORMULA ENTRY
    RF—ROW FORMULA ENTRY
    AV—ASSIGN VARIABLES
    CA—CALCULATE
    ET—ENTER TEXT
    CR—CLEAR ROW
    CC—CLEAR COLUMN
    CW—CHANGE COLUMN WIDTH
    FR—DISPLAY FREE MEMORY
       PRESS <ENTER> TO CONTINUE
```

Press ⌨ENTER⌨ to see the rest of the 20 commands and a list of special keys. A brief description of each command follows.

```
C>
    COMMAND SET—PAGE 2
    ZW—ZAP WORKSHEET
    DR—DELETE ROW
    DC—DELETE COLUMN
    IR—INSERT ROW
    IC—INSERT COLUMN
    SA—SAVE ON DISK
    PS—PARTIAL SAVE ON DISK
    LO—LOAD FROM DISK
    LI—LIST TO PRINTER
    SPECIAL KEYS:
       BREAK—ENTER COMMAND MODE
       CLEAR—BACKSPACE
       ?—HELP LIST
```

MOVE MARKER—Lets you view any portion of the worksheet.

ENTER NUMBERS—Up to nine digits.

COLUMN FORMULA ENTRY—Specifies how that column is to be calculated from data in preceding columns.

ROW FORMULA ENTRY—Specifies how given rows in the worksheet are to be calculated from data in preceding rows.

ASSIGN VARIABLES—Lets you assign values to variables that can be used in formulas.

CALCULATE—The values in formula-defined rows and columns are calculated and displayed.

ENTER TEXT—Letters, numerals and all other upper and lower case characters (up to 27 characters). Only capital letters are displayed and printed. Labels (row and column headings) make a worksheet easier to read.

CLEAR ROW—Deletes calculated values in a row, without deleting number entries or any formula associated with that row.

CLEAR COLUMN—Deletes calculated values in a column, without deleting number entries or any formula associated with that column.

CHANGE COLUMN WIDTH (the number of spaces a column contains)—Any value from 2 through 27. The default value (value built into the program) is 7.

DISPLAY FREE MEMORY—Shows how much room you have in memory to store data. Each worksheet can contain up to 2555 characters on a 16K computer and 18,939 characters on a 32K computer. The amount of free memory decreases as you enter data.

ZAP WORKSHEET—Erases the current worksheet on the screen and in memory, allowing you to start a new worksheet.

DELETE ROW—Erases data (text and numbers) in a row and any formula associated with that row. Data in succeeding rows shifts upward.

DELETE COLUMN—Erases data (text and numbers) in a column and any formula associated with that column. Data in succeeding columns shifts to the left.

INSERT ROW—Inserts rows, allowing you to enter data or create a blank row. Data in succeeding rows shift downward.

INSERT COLUMN—Inserts columns, allowing you to enter data or create a blank column. Data in succeeding columns shift to the right.

SAVE ON DISK—Lets you save the worksheet in memory on disk.

PARTIAL SAVE ON DISK—Lets you save a portion of the current worksheet on disk.

LOAD FROM DISK—Loads a file that was saved on disk, back into memory.

LIST TO PRINTER—Lets you print all or part of the worksheet (in memory) on a serial printer.

To enter a command, type the two-letter combination that stands for the command and press (ENTER). If you enter a command incorrectly, the message, COMMAND ERROR appears at the top of the screen. Reenter the correct two-letter abbreviation.

Press the (BREAK) key to return to command mode. (Some commands are performed automatically, without any further instructions from you. While these commands are being executed, you stay in command mode.

All commands (except the "automatic" ones) have a "help" list which gives instructions and examples on how to use the command. After you have entered the command, type (?) to see the help list. Type (?) to return to the same command.

You can enter data while any help list is displayed. With the Enter Numbers, Enter Text, and Assign Variables commands, part of the help list may be temporarily erased by the data entered. (This depends upon where the entry marker was positioned before you typed (?).) Press (BREAK) to return to the worksheet. The data will be displayed in the cell at the entry marker position.

If you make a mistake when entering a command, numbers, text, or further instructions to the computer, press the (CLEAR) key to backspace and erase the character that was previously there. Press the (SHIFT)(CLEAR) keys to retype the entire entry.

To return to BASIC, you can press the Reset button or type: (B)(A) and press (ENTER). You can then use the "Directory" command to see what files you have saved on disk (see page 20) or use the "Free" command to see how much free space you have on the disk.

The data you enter on a worksheet is temporarily stored in the computer's memory. If you press the Reset button, turn off the computer, or use the Zap Worksheet command (and have not saved the data on disk), the data is lost. Be sure to remove the Spectaculator program disk (and any other disks) before turning off the computer or the disk system.

Part II–Commands

Move Marker

To move the black entry marker up and down or to the right and left, use the four arrow keys. The entry marker moves over data without erasing any characters. Press an arrow key once to move the marker one space. For example, press the ⟶ key four times to move the marker to Column 5. Note that now Columns 2-5 are visible. Next, press the ⟱ key 13 times, so that Rows 2-14 are visible. The entry marker is currently at Cell 14,5 (Row 14, Column 5).

There is a much faster way to move the marker if you are entering data on a large worksheet. Type Ⓜ Ⓜ (for Move Marker) and press ⟨ENTER⟩. Type ⟨?⟩ to see the MOVE MARKER HELP list.

The screen shows:

```
MM

    MOVE MARKER HELP

  *   TYPE ROW NO., COLUMN NO.
  *   PRESS <ENTER>

      <ENTER> ALONE HOMES THE
          MARKER
```

Now, type ② ⑤ · ② ⑤ (no spaces) and press ⟨ENTER⟩. (You can enter the cell while in the help screen or type ⟨?⟩ to return to the worksheet.)

The screen shows:

```
C>■
         25      26      27      28
25 � ▬ ▬ ▬ ▬ ▬
26
27
28
29
30
31
32
33
34
35
36
37
```

Commands (continued)

Note that not only has the marker moved to Row 25, Column 25, but a different portion of the worksheet is on display. The cell you entered occupies the upper left-hand corner of the worksheet. After a cell is entered, the command mode prompt automatically reappears.

Next, we want to move the marker to the "home" cell (Cell 1,1). Type Ⓜ Ⓜ and press ⌈ENTER⌉. Now, simply press ⌈ENTER⌉. The marker is now at Row 1, Column 1 and Rows 1–13 and Columns 1–4 are on display.

If you enter a cell incorrectly (e.g., with a space after the comma), the message, SYNTAX ERROR appears at the top of the screen. Press the ⌈CLEAR⌉ key to backspace the cursor, so that you can reenter the cell.

Enter Numbers

You can enter numbers of up to nine digits. (The column width is currently set at 7. To change the column width, see page 19.)

Move the entry marker to the cell where you want to enter a number. In command mode, type (E)(N) (Enter Numbers) and press (ENTER). Type (?) to see the ENTER NUMBERS HELP list.

The screen shows:

```
EN:
    ENTER NUMBERS HELP

    NUMBERS ENTRIES ARE RIGHT-
    JUSTIFIED INSIDE THE
    MARKER.

    LIMITS:
    * 9 DIGITS
    * 6 DIGITS TO THE RIGHT OF
      THE DECIMAL POINT
```

Type (?) to return to the worksheet. After you type the number and press (ENTER), the number is displayed in the cell. (The number is aligned to the right inside the entry marker box.)

If you entered a wrong number or wish to change an entry, simply move the marker to the cell and enter the desired number. The new number will replace the previous entry. To erase a number (and leave the cell blank), move the marker to the desired cell and press (ENTER).

If you enter any character other than a number or decimal point, the message, SYNTAX ERROR is displayed. Press (CLEAR) to backspace. To reenter the entire number, press (SHIFT)(CLEAR). When you are finished entering numbers, press (BREAK). The command mode prompt reappears.

Column Formula Entry

A column formula specifies how values in that column are to be calculated from data in preceding columns. For example, suppose you want to enter a column formula for Column 4 to add the numbers in Columns 1, 2, and 3. The calculated value in Cell 1,4 will be the total of the numbers in Cells 1,1; 1,2; and 1,3. The calculated value in Cell 2,4 will be the total of the numbers in Cells 2,1; 2,2; and 2,3, etc..
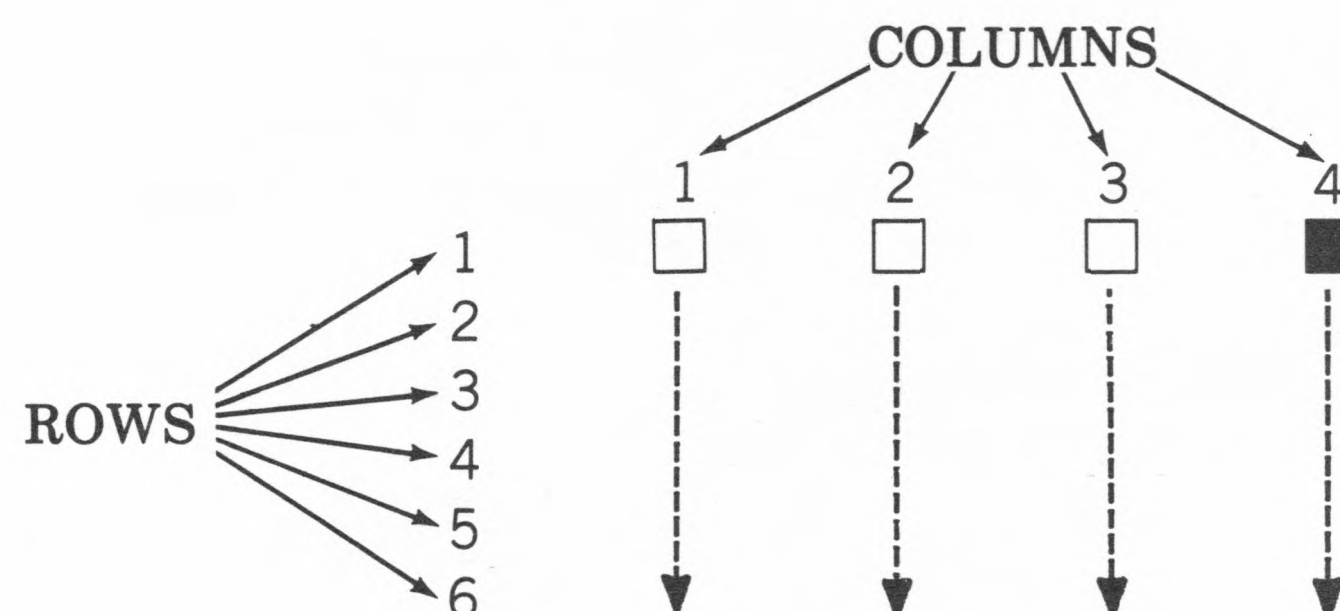
To enter a column formula, move the entry marker to the column where you want the calculated value to appear. (The entry marker can be on any cell in the column.) Type C F and press ENTER.

To see the COLUMN FORMULA HELP, type ?.

The screen shows:

```
CF:
COLUMN FORMULA ENTRY HELP

EXAMPLE FORMULA:
(C1–C2) / 2 + 5 * SQR(C3)

OPERATORS: + — * / ( ) !

FUNCTIONS: SUM SQR SMT

PRECEDE FORMULA WITH "I" OR
"D" FOR INTEGER OR DECIMAL
RESULT.
```

All mathematical operations are performed from left to right. Multiplication and division operations are done first, then addition and subtraction are performed (unless enclosed in parenthesis). With parenthesis within another pair of parenthesis, operations are performed beginning with the innermost parenthesis and working outward.

In the example on the previous page, the computer first subtracts the value in Column 2 from the value in Column 1 and then divides the resultant value by 2. Next, the square root of the value in Column 3 is multiplied by 5. Finally, these two values are added together.

The addition and subtraction symbols are the same as those regularly used in math. Multiplication is indicated by an asterisk, *, while division is indicated by a slash, /. Parenthesis tell the computer to perform the enclosed operation first.

Exponents are indicated by an exclamation point, ! followed by the number showing the exponential power. For example, 10^2 would be 10!2. Numbers raised to a fractional power (e.g., $10^{1/3}$) will only be accurate to six significant digits.

SQR tells the computer to take the square root of the values in the specified column following the letters, SQR.

SUM stands for "sum" and tells the computer to add the values starting from The specified column to the column where the entry marker is positioned. For example, if the entry marker is positioned on Column 5 and you enter the formula, (S)(U)(M)(C)(1), Spectaculator will add the numbers in Columns 1 through 4. (This is a shortcut way of entering the formula, C1+C2+C3+C4.) After you use the Calculate command, the total will be displayed in Column 5.

SMT stands for "summation" and tells the computer to give the cumulative totals along with the final computed total value of one specified column. For example, if the entry marker is positioned on Column 5 and you enter the formula, (S)(M)(T)(C)(1), followed by the Calculate command, Spectaculator will calculate and display a cumulative sum of the numbers in Column 1. The calculated value in Cell 1,5 will be the same value as in Cell 1,1. The sum of Cell 1,1 and Cell 2,1 will be displayed in Cell 2,5. Cell 3,5 will contain the sum of Cells 1,1; 2,1; and 3,1; etc.

Note: The column you specify after the letters, SUM must have a value in it. The SUM operation will not be performed if there is no number in the specified column. However, a blank cell in a subsequent column is assumed to contain a value of 0 and a sum will be calculated. In all other column formulas, calculations will not be performed for those cells that are blank. This holds true for row sums and formulas, as well.

You can also specify whether you want the calculated value to be expressed as an integer or decimal number. Simply, type (I) or (D) before the formula. If you specify (I), the calculated value will be displayed, showing only the numbers to the left of the decimal. If you choose (D), the value will be carried out to six decimal places. However, the computer automatically deletes trailing zeroes.

If you don't specify "I" or "D," the computer automatically calculates the

formula, using a dollar and cents form, by carrying the value out to two decimal places. (This is particularly useful for financial data.)

Type the formula and press ⌨ENTER. Do not use spaces when you enter formulas. (You can type the formula while in the help screen or type ⌨? to return to the worksheet.)

The SYNTAX ERROR message appears if you enter a formula incorrectly or include spaces. Press the ⌨CLEAR key to backspace and type over the mistake. Press ⌨SHIFT ⌨CLEAR to reenter the entire formula. When you are finished entering formulas, press ⌨BREAK to return to command mode.

If you move the entry marker to a column where a formula has been entered, the formula is displayed at the top of the screen.

If you wish to change a formula entry, simply move the marker to the desired column and enter the new formula. The new formula will replace the old formula. To delete a formula, move the marker to the desired column, type ⌨C ⌨F and press ⌨ENTER twice.

Note: You can also include variables in column or row formulas. See "Assign Variables" on page 14.

Row Formula Entry

A row formula specifies how values in that row are to be calculated from data in preceding rows. For example, suppose you want to enter a row formula for Row 4 to add the numbers in Rows 1, 2, and 3. The calculated value in Cell 4,1 will be the total of the numbers in Cells 1,1; 2,1; and 3,1. The calculated value in Cell 4,2 will be the total of the numbers in Cells 1,2; 2,2; and 3,2, etc..
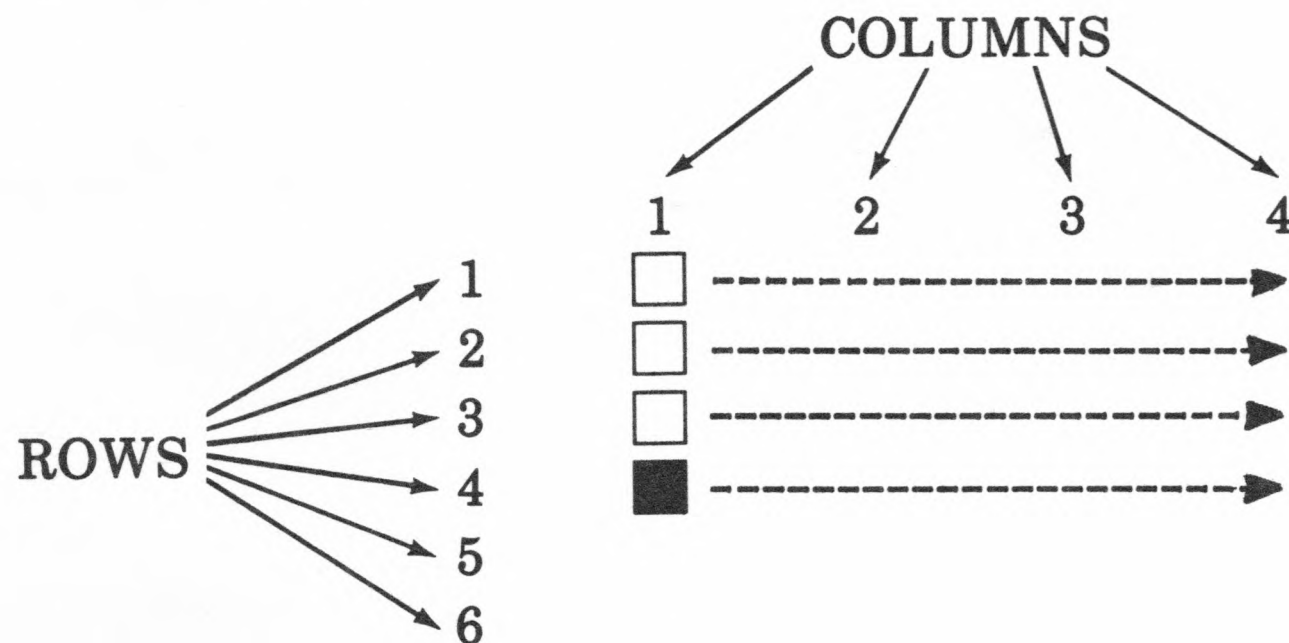
To enter a row formula, move the entry marker to the row where you want the calculated value to appear. (The entry marker can be on any cell in the row.) Type (R)(F) and press (ENTER) at the command mode prompt.

Type the formula and press (ENTER). Row formulas are entered in the same way column formulas are. (The ROW and COLUMN FORMULA HELP screens are identical.) If the entry marker is on a cell where both a row and column formula have been entered, the row formula takes precedence and is displayed at the top of the screen. The numbers in the specified rows under each column are used to come up with the computed values.

If you wish to change a formula entry, simply move the marker to the desired row and enter the new formula. The new formula will replace the old formula. To delete a formula, move the marker to the desired row, type (R)(F) and press (ENTER) twice.

Assign Variables

To use a variable in column or row formulas, you must first assign a value to the variable. In command mode, type (A)(V) and press (ENTER).

The screen shows:

AV: ■

VA ▬▬▬▬	VB
VC	VD
VE	VF
VG	VH
VI	VJ
VK	VL
VM	VN
VO	VP
VQ	VR
VS	VT
VU	VV

There are 22 available variables that you can use in formulas (VA through VV). To see the ASSIGN VARIABLES HELP, type (?).

The screen shows:

AV:

ASSIGN VARIABLES HELP

* NUMERIC ASSIGNMENTS
LIMITS
    9 DIGITS
    6 DIGITS TO THE RIGHT
    OF THE DECIMAL POINT

*CELL ASSIGNMENTS
EXAMPLES:
    R125C   R#C5
    R5C14   R5C#

You can either assign a constant numeric value or the value of a particular worksheet cell to a variable. As in the Enter Numbers command, you can enter up to nine digits per variable.

You can also use the value of a cell as a variable. Remember that a cell is defined

by its location, i.e., by its unique row number and column number. Taking the above examples in the ASSIGN VARIABLES HELP:

R12C5 means that the variable is assigned the value of Cell 12,5 (Row 12, Column 5).

R5C14 means that the variable is assigned the value of Cell 5,14 (Row 5, Column 14).

R#C5 means that the variable is assigned the value of the cell in the row preceding the row currently being calculated and in Column 5. For example, if Row 5 is currently being calculated, the variable in the formula will be assigned the value in Cell 4,5.

R5C# means that the variable is assigned the value of the cell in Row 5 and in the column preceding the column currently being calculated. For example if Column 10 is currently being calculated, the variable in the formula will be assigned the value in Cell 5,9.

Type (?) to return to the AV command. Move the entry marker to the desired variable cell. Type the value of the variable and press (ENTER). Use the (CLEAR) key to backspace if you make a mistake.

For example, suppose you want to figure out the interest payments against outstanding credit card balances. First, enter the outstanding balances in Column 1. Next, assign the constant interest rate of .015 (which is 18%/12) to variable, V1. You would move the entry marker to Column 2 and enter the formula, C1*V1. After you use the Calculate command, the interest payments would be displayed in Column 2.

Calculate

To have Spectaculator calculate and display the values in all formula–defined columns and rows, type ⒞Ⓐ and press ⒺⓃⓉⒺⓇ at the command mode prompt. (If both a row and column formula are entered for the same cell, the value for the row formula will be displayed.) This command is executed automatically without any further instructions from you. The screen changes color while Spectaculator is calculating the values. The command mode prompt reappears and the screen turns back to green after all calculations have been performed.

Spectaculator automatically adjusts the column width to display the entire calculated value. If a calculated value is extremely large, the message, OVERFLOW ERROR may appear and the value will not be displayed. The Row and Column numbers of the cell where Spectaculator could not calculate the value will be displayed at the top of the screen.

Press ⒷⓇⒺⒶⓀ to return to command mode. All calculated values up to the cell where the calculation error occurred will be displayed. (If the overflow error was caused by a column formula, no row formula calculations will be displayed. Only column formula calculations up to that column will be performed and displayed.) You can either change: 1) the formula from D to I, or, 2) the values in the worksheet. Enter the Calculate command again to see the computed values.

Enter Text

A text entry can contain up to 27 characters. Letters, numerals, and all other upper and lower case characters can be used. All letters are displayed (and printed) as capitals.

Move the entry marker to the cell where you want to enter text. In command mode, type E T and press ENTER. After you type the text and press ENTER, the text is displayed in the cell. (The text is aligned to the left inside the entry marker box.)

If you make a mistake, simply move the marker to the cell and reenter the text. The old entry is replaced with the correct text. (While entering text, use the CLEAR key to backspace.) Type ? to see the ENTER TEXT HELP list.

The screen shows:

```
ET:

    ENTER TEXT HELP

    TEXT ENTRIES ARE LEFT-
    JUSTIFIED INSIDE THE MARKER.

    LIMIT:
    * 27 CHARACTERS
```

To center text over a column, simply press the space bar a few times before typing the text and pressing ENTER. (You can also use the Change Column Width command to center text.)

To erase unnecessary calculated figures permanently from a worksheet, move the entry marker to the cell and type E T. Press the space bar once and then press ENTER. The next time you use the Calculate command, no calculated figure will be displayed and the cell will stay blank.

When you are finished entering text, press BREAK. The command mode prompt reappears.

Note: If numbers are entered with the ET command instead of the EN command, no calculation will be performed.

Clear Row

To erase the calculated values in a row, move the entry marker to the desired row. Only calculated values are erased—formula and number entries are not affected. Type ⒸⓇ and press ⒺⓃⓉⒺⓇ. The calculated values are erased and the command mode prompt reappears.

The Clear Row and Clear Column commands are particularly useful if you want to save a large worksheet with number entries and formulas intact. You will be using less disk space if you save worksheets without the calculated values. (Simply use the Calculate command again to see the calculated values.)

Clear Column

To erase calculated values in a column (leaving the column formula and number entries intact), move the entry marker to the desired column. Type ⒸⒸ at the command mode prompt and press ⒺⓃⓉⒺⓇ. The calculated values are erased and the command mode prompt reappears.

Note: You cannot use these commands if no data has been entered.

Change Column Width

You can change the column width (i.e., the number of spaces a column contains) from the default value of 7 to any value from 2 through 27. After the width has been changed, the worksheet is displayed (and printed) using the new width.

In command mode, type ⒞Ⓦ and press ⒺⓃⓉⒺⓇ. Type ⑦ to see the CHANGE COLUMN WIDTH HELP list.

The screen shows:

```
CW:
    CHANGE COLUMN WIDTH HELP

    ENTER COLUMN NUMBER, WIDTH
    EXAMPLE CW: 12,9

    TYPE "ALL" FOR COLUMN NUMBER
    TO CHANGE THE WIDTH OF ALL
    COLUMNS

     LIMIT:
     * 2–27
```

You can enter the Change Column Width instructions while in the HELP screen, or type ⑦ to return to the CW command. To change the width of one column, type that column number and a comma (no space after the comma). Next, type the value representing the number of spaces wide you want the column to be and press ⒺⓃⓉⒺⓇ. The worksheet display changes automatically. Press ⒷⓇⒺⒶⓀ to return to command mode.

To change the width of all columns, type ⒶⓁⓁ and a comma. Next, type the width and press ⒺⓃⓉⒺⓇ. The command mode prompt reappears and the worksheet display changes automatically.

Be careful when using this command. If you make the width smaller and the data (numbers or text) contains more characters than the newly specified width, some of the characters will be erased. Don't worry, however, because the original data is still in the computer's memory. If you change the width again to the original value, the data in its entirety will be displayed.

Display Free Memory

To find out how much room you have in memory to store data, type (F)(R) and press (ENTER) in command mode. The number of "free" characters left in memory is displayed above the command mode prompt.

A worksheet on a 16K computer can contain up to 2555 characters. There is room for 18,939 characters per worksheet on a 32K computer. The free memory decreases as you enter data.

If there are no characters left in memory, the message, OUT OF MEMORY appears at the top of the screen. (This can happen when you try to: enter numbers, text, formulas; use the Calculate command; change the column width; or insert rows or columns.) You will have to delete some data to continue using the same worksheet. Or you can save the worksheet currently in memory on disk and start a new worksheet. (See "Save on Disk" on page 23.)

Zap Worksheet

To erase the current worksheet on the screen and start a new worksheet, type (Z)(W) and press (ENTER). Use the Save on Disk command (page 23) before using the ZW command, if you want to keep the current worksheet. You return to command mode automatically.

Delete Row

To erase text and numbers in a row and any formula associated with that row, you must first position the entry marker on that row. Type (D)(R) and press (ENTER) in command mode. This is an "automatic" command, i.e., you do not have to enter any further instructions.

The data (and formula if entered) originally in that row is erased. The data (and formula) in the next row (the row below) shifts up to the row where the entry marker is positioned. The row numbers in formulas are changed so that the same values are used in calculations. Data (and formulas) in succeeding rows also shift up one row. The command mode prompt automatically reappears.

Delete Column

To erase data in a column and any formula associated with that column, move the entry marker to that column. Type (D)(C) and press (ENTER). The data in the next column (the column to the right) shifts left to the column where the entry marker is positioned. Data (and formulas) in all succeeding columns shift one column to the left. You return to command mode automatically.

Note: You cannot use the Delete commands if no data has been entered on the worksheet.

Insert Row

To insert a row of data (or a blank row), move the entry marker to the desired row. Type ⌑I⌑ ⌑R⌑ and press ⌑ENTER⌑. The data and formula originally in that row (and all succeeding rows) shift downward one row. The row numbers in formulas are changed so that the same values are used in calculations. If the row contains no data, another blank row is created. The command mode prompt reappears, allowing you to enter text or numbers.

Insert Column

To insert a column of data (or a blank column), move the entry marker to the desired column. Type ⌑I⌑ ⌑C⌑ and press ⌑ENTER⌑. The data and formula originally in that column (and all succeeding columns) shift to the right one column. If the column does not contain data, another blank column is created. You return to command mode automatically.

Note: You cannot use the Insert commands if no data has been entered on the worksheet.

Save on Disk

To save a worksheet on disk, type ⓈⒶ and press ⒺⓃⓉⒺⓇ in command mode. Type ⍰ to see the DISK SAVE HELP list.

The screen shows:

SA:

DISK SAVE HELP

 * TYPE FILE NAME

 * PRESS ENTER

Follow the instructions on the screen. (You can either return to the worksheet by typing ⍰ or continue while in the DISK SAVE HELP screen.)

Type a file name (up to eight characters) and press ⒺⓃⓉⒺⓇ. A file name is a title that the computer uses to reference the worksheet. The computer uses a disk just like you use a filing cabinet. Later, to find a file, the computer looks in the filing cabinet (the disk) for the file name and gets (loads) the file you want.

The Command mode prompt reappears after the file has been saved and the red light on the drive door has gone off. Write the file name you entered on the disk label and/or the disk sleeve.

It's a good idea to save the file again (using a different file name) as a precaution.

If you see the message DISK FULL, the file will not be properly saved on the disk. The file will be listed in the Directory but will not be usable. To save the file, insert another disk (with the Spectaculator program on it) in Drive 0 and repeat the Save command.

If you have more than one drive, you can use a disk drive specification in your file name to save the file on another drive. For example, to save the file, TEST on Drive 1, insert a formatted disk in Drive 1 and close the door. Type ⓈⒶ and press ⒺⓃⓉⒺⓇ. For the file name, type: ⓉⒺⓈⓉⓒⓁ and press ⒺⓃⓉⒺⓇ.

To see what files you have on disk, press the Reset button (or type: ⒷⒶ and press ⒺⓃⓉⒺⓇ). Then type ⒹⒾⓇ and press ⒺⓃⓉⒺⓇ. All files that you create have an SPC extension. To delete a file, use the KILL command. (See page 20 of the Owners Manual for details.) For example, if you want to delete the file, TEST, you would type: ⓀⒾⓁⓁ "ⓉⒺⓈⓉ/ⓈⓅⒸ" and press ⒺⓃⓉⒺⓇ.

Partial Save on Disk

To save part of a worksheet, type `P` `S` and press `ENTER` at the command mode prompt. This command may be useful when you just want to save data of one worksheet (without text or formulas) to be used in another worksheet. Type `?` to see the PARTIAL SAVE HELP.

The screen shows:

PS:

      PARTIAL SAVE HELP
    * POSITION MARKER ON THE
      FIRST CELL THAT IS TO BE
      SAVED
    * TYPE ROW NO., COLUMN NO. OF
      THE LAST CELL THAT IS TO BE
      SAVED, FILE NAME
    * PRESS ENTER

Type `?` to return to the worksheet. Move the entry marker to the first cell of the portion of the worksheet that you want saved. Next, type the row number, a comma, and then the column number of the last cell that you want to save. Type another comma, and then the file name (up to eight characters). Finally, press `ENTER`. Do not include any spaces.

For example, suppose you wanted to save data between Cells 3,1 and 10,8 under the file name, DATA. First, position the entry marker on Cell 3,1. Type `P` `S` and press `ENTER`. Now type: `1` `0` `·` `B` `·` `D` `A` `T` `A` and press `ENTER`.

After the portion of the worksheet has been saved, the red light on the drive door goes off and the command mode prompt reappears. As a precautionary measure, save the file again using a different file name.

Load from Disk

To load a file from disk back into memory, type ⬭L⬭O⬭ and press ⬭ENTER⬭.
Type ⬭?⬭ to see the DISK LOAD HELP list.

The screen shows:

> LO:
>
> DISK LOAD HELP
>
> * TYPE FILE NAME
>
> * PRESS ENTER

Follow the instructions on the screen. (You can either return to the worksheet by
typing ⬭?⬭ or continue while in the DISK LOAD HELP screen.)

Type the name of the file you want to load and press ⬭ENTER⬭. The worksheet
saved under that file name appears on the screen. You return to command mode
automatically.

List to Printer

A worksheet must be in memory to be printed. If you are not printing a worksheet that you have just entered, load the desired worksheet file from disk. Make sure the paper is properly aligned and the printer is ready. (If you are using a Radio Shack Line Printer VII, move the switch on the back of the printer to the 7 bit-serial position.)

In command mode, type (L)(I) and press (ENTER). To print an entire worksheet, position the entry marker on Cell 1,1 and press (ENTER). (Only data is printed—row and column numbers do not appear on the printout.) After the printing is finished, press (BREAK) to return to command mode.

Note: Only 80-column serial printers are compatible with Spectaculator. A maximum of 61 rows (with 80 characters per row) may be printed per page. If a worksheet contains more than 61 rows, follow these instructions. When the printer stops after printing the first 61 rows, realign the paper and move the cursor to Cell 62,1 (Row 62, Column 1). Next, type: (L)(I) and press (ENTER) to continue printing. If you are printing a worksheet with more than 80 characters per row, you will also have to reposition the cursor on the appropriate cell and reenter the LI command to print all columns.

If you want to print just part of a worksheet, type (L)(I) and press (ENTER). Type (?) to see the PRINT HELP list.

The screen shows:

LI:

    PRINT HELP
    * POSITION MARKER ON THE
      FIRST CELL THAT IS TO BE
      PRINTED
    * TYPE ROW NO., COLUMN NO. OF
      THE LAST CELL THAT IS TO BE
      PRINTED
    * PRESS ENTER

Refer to the HELP list instructions to print a section of the worksheet. Type (?) to return to the LI command. Move the entry marker to the cell where you want to start printing. (On the printed copy, this cell appears in the upper left-hand corner.)

Next, type the row number, a comma, and then the column number of the cell where you want the printing to stop. Do not include spaces. (This cell appears in the lower right-hand corner on the printed copy.) When you press (ENTER),

the printing begins.

	1	2	3	4	5	6	7	8

1
2
3
4
5
6
7
8
9
10
11
12
13

Note: You do not have to specify the last cell. If you move the entry marker to the first cell you want printed and do not specify the last cell to be printed, Spectaculator will start printing from the cell where the marker is positioned and print to the end of the worksheet.

If the message, PRINTER NOT READY appears on the screen, check all cables and plugs. Once the printer is ready, press ENTER to start the printer.

To stop printing, hold down the BREAK key until the printing has stopped. (A couple of additional lines of text may be printed.)

To center a worksheet on a page, use the Insert Column command at Column 1 to create some blank columns on the left of the page.

Part III—Sample Session

To become familiar with Spectaculator we'll take you through a sample session involving the construction of a simple addition table. You'll also learn how to use the same table, enter new numbers, and see how Spectaculator will recalculate all values. Finally, you'll find out how to save and print the table.

First, make sure that the disk interface, cable, and drive(s) are properly connected. If you have a serial printer, connect it to the computer. (Refer to pages 1–3 of the Owner's Manual if you have any questions.) Turn on the TV. Next, turn on the computer and disk drives. The screen should show:

```
DISK EXTENDED COLOR BASIC v.r.
COPYRIGHT (C) 1981 BY TANDY
UNDER LICENSE FROM MICROSOFT

OK
```

(v.r. is two numbers specifying which version and release you have.) If this copyright message does not appear on your screen, turn off the computer, check all connections, and power up again.

Insert a Backup copy of the original program disk in Drive 0 and close the drive door. Type: `R` `U` `N` `"` `D` `O` `S` `"` and press `ENTER` In a few seconds, you will see SPEC at the upper left-hand corner of the screen. The worksheet with the command mode prompt will soon be displayed.

First, we're going to enter numbers in the worksheet. At the command mode prompt, type `E` `N` (Enter Numbers) and press `ENTER`. Type `1` and press `ENTER`. Next, press the → key once to move the entry marker to Cell 1,2 (Row 1, Column 2). Type `2` and press `ENTER`.

To move the cursor to Cell 2,1, press the ← key once and then the ↓ key once. Type `3` and press `ENTER`. Now, press the → key once. Type `4` and press `ENTER`. To move the cursor to Cell 3,1, press the ← key once and then the ↓ key once. Type `5` and press `ENTER`. Press the → key once

to move the cursor to Cell 3,2. Type ⑥ and press ⒺⓃⓉⒺⓇ. The screen looks like this:

```
EN:
                 1         2         3         4
      1          1         2
      2          3         4
      3          5         6
      4
      5
      6
      7
      8
      9
     10
     11
     12
     13
```

Press ⒷⓇⒺⒶⓀ to exit the EN command. Now we want to enter a formula in Column 3, so press → once. Type ⒸⒻ (Column Formula) and press ⒺⓃⓉⒺⓇ. To add the numbers in Column 1 and Column 2, type: Ⓒ①＋Ⓒ② and press ⒺⓃⓉⒺⓇ.

Press ⒷⓇⒺⒶⓀ to exit the CF command. Press ↓ to enter a formula in Row 4. Type ⓇⒻ (Row Formula) and press ⒺⓃⓉⒺⓇ. To add the numbers in Rows 1, 2 and 3, type: Ⓡ①＋Ⓡ②＋Ⓡ③ and press ⒺⓃⓉⒺⓇ.

Press ⒷⓇⒺⒶⓀ to return to command mode. Type ⒸⒶ (Calculate) and press ⒺⓃⓉⒺⓇ, to see the computed values.

The screen shows:

```
C>
                 1         2         3         4
      1          1         2      3.00
      2          3         4      7.00
      3          5         6     11.00
      4       9.00     12.00     21.00
      5
      6
      7
      8
      9
     10
     11
     12
     13
```

We want to label the table and have column and row headings, but first, we're going to have to insert some blank rows and columns.

Move the entry marker to the "home" cell (Cell 1,1) by typing ⓂⓂ (Move Marker) and pressing ⎡ENTER⎤. Press ⎡ENTER⎤ again. To insert three blank rows at the top of the table, type ⒾⓇ and press ⎡ENTER⎤. Repeat the Insert Row command two more times.

To insert a blank row between the main table and the calculated values, move the entry marker to Row 7. Type ⒾⓇ and press ⎡ENTER⎤.

To insert a blank column at the extreme left of the table, type ⒾⒸ (Insert Column) and press ⎡ENTER⎤. Now, to insert a blank column between the main table and the calculated values, move the entry marker to Column 4. Type ⒾⒸ and press ⎡ENTER⎤. When you move the entry marker to Column 5 to see the row totals, the table looks like this:

```
C>
            2       3       4       5
  1
  2
  3
  4         1       2              3.00
  5         3       4              7.00
  6         5       6             11.00
  7
  8       9.00   12.00           21.00
  9
 10
 11
 12
 13
```

To enter the title of the table, move the entry marker to Cell 1,2. Type ⒺⓉ (Enter Text) and press ⎡ENTER⎤. Type: ⒶⒹⒹⒾⓉⒾⓄⓃ ⓉⒶⒷⓁⒺ and press ⎡ENTER⎤. Now, move the entry marker to Cell 3,5. Type: Ⓡ·ⓉⓄⓉⒶⓁ and press ⎡ENTER⎤.

Move the entry marker to Cell 8,1. Type: Ⓒ·ⓉⓄⓉⒶⓁ and press ⎡ENTER⎤.

The table looks like the one below. (To see the Row Total column, press ⟶.)

```
ET:
              1       2        3       4       5
      1             ADDITION TABLE
      2
      3                                      R. TOTAL
      4             1        2                 3.00
      5             3        4                 7.00
      6             5        6                11.00
      7
      8  C.TOTAL   9.00    12.00             21.00
      9
     10
     11
     12
     13
```

In order to see the entire table on the screen, we're going to change the widths of Columns 2–4. (The text in Columns 1 and 5 contain seven characters, so we want to leave these columns alone.) Press (BREAK) to exit the ET command.

Type ©W (Change Column Width) and press (ENTER). Now, type: ②·⑥ and press (ENTER). To change the width of Column 3, type: ③·⑥ and press (ENTER). Finally, to change the width of the blank Column 4, type: ④·② and press (ENTER).

The table looks a lot neater, but since we changed the width of some columns, the title, ADDITION TABLE has been affected. Press (BREAK) to enter command mode. Move the entry marker to Cell 1,2. Type ©T and press (ENTER). Retype ⒶⒹⒹⒾⓉⒾⓄⓃ ⓉⒶⒷⓁⒺ. When you press (ENTER), you'll see the final version of our addition table.

```
ET:
            1      2      3   4    5
     1           ADDITION TABLE
     2
     3                            R.TOTAL
     4           1      2          3.00
     5           3      4          7.00
     6           5      6         11.00
     7
     8  C.TOTAL  9.00  12.00      21.00
     9
    10
    11
    12
    13
```

Next, we're going to save and print the table. Press (BREAK) to exit the ET command. Type (S)(A) (Save on Disk) and press (ENTER). For the file name, type: (A)(D)(D)(T)(A)(B)(L)(E) and press (ENTER). The red light on the drive door goes off and the command mode prompt reappears after the file has been recorded. Repeat this process (using a different file name) to make another copy of the file as a precautionary measure.

(When you want to load the file at a later time, type (L)(O) (Load from Disk) and press (ENTER) in command mode. Type the file name and press (ENTER). The addition table is displayed after the file has been loaded back into memory.)

To print the addition table, first, move the entry marker to Cell 1,1, by typing (M)(M) and pressing (ENTER). Press (ENTER) again. Type (L)(I) (List to Printer) and press (ENTER) in command mode. Make sure the paper is properly aligned and the printer is ready. Press (ENTER). After the printing is finished, the command mode prompt reappears. The printed copy looks like the one below. Note that only data is printed—row and column numbers do not appear on the printed copy.

```
           ADDITION TABLE

                          R.TOTAL
            1        2       3.00
            3        4       7.00
            5        6      11.00

   C.TOTAL  9.00 12.00      21.00
```

If the message, PRINTER NOT READY appears on the screen, check all cables and plugs. Once the printer is ready, the printing begins.

You can have Spectaculator use the same worksheet format and calculate the same formulas using different numbers. Press (BREAK) to return to command mode. Using the EN command, enter the following numbers. (Remember that you can simply overtype the original numbers.)

1. (5) in Cell 4,2.
2. (6) in Cell 4,3.
3. (7) in Cell 5,2.
4. (8) in Cell 5,3.
5. (9) in Cell 6,2.
6. (1)(∅) in Cell 6,3.

When you enter the CA command, the new totals will be displayed.

Move the entry marker to Column 6. Type `C` `F` and press `ENTER`. For the column formula, type: `S` `M` `T` `C` `5` and press `ENTER`. Use the CA command to see the cumulative totals of Column 5. Note that the value in Cell 4,6 is the same value as in Cell 4,5. The calculated value in Cell 5,6 is the sum of the values in Cell 4,5 and 5,5. The sum of Cells 4,5; 5,5; and 6,5 is displayed in Cell 6,6.

The calculated value in Cell 8,6 was calculated using the original row formula, i.e., R1+R2+R3. Since we inserted three rows, the row numbers in the formula have changed to: R4+R5+R6. (Remember that if both a row and column formula are entered for the same cell, the row formula is calculated and that resultant value is displayed.)

Next, move the entry marker to Cell 3,6. Type `E` `T` and press `ENTER`. Press the space bar twice and then type: `C` `.` `S` `U` `M` and press `ENTER`. (This stands for CUMULATIVE SUM.)

The new table looks like the one below. (Press `←` five times to see the C.TOTAL label.)

```
ET:
              1       2      3    4      5        6
    1                 ADDITION TABLE
    2
    3                                  R.TOTAL   C.SUM
    4                 5       6         11.00    11.00
    5                 7       8         15.00    26.00
    6                 9      10         19.00    45.00
    7
    8  C.TOTAL     21.00   24.00        45.00    82.00
    9
   10
   11
   12
   13
```

(If you want to save this new table, use the SA command, but enter a different file name.)

When you are finished using the program, be sure to remove the disks before turning off the computer.

Part IV—Advanced Sessions

Geometry

To calculate the circumference and area of a circle, and the volume and surface area of a sphere, the following formulas are used:

Circumference $= 2\pi r$

Area of Circle $= \pi r^2$

Volume of Sphere $= {}^4/_3 \pi r^3$

Surface Area of Sphere $= 4\pi r^2$

where:

π = Pi (3.14159)
r = Radius

To produce the printout on page 36, follow the instructions below, using the values of the radii given in the printout. To see the finished worksheet and compare with your own, load the file, GEOMETRY from the Spectaculator disk.

1. Enter the following ⒸⓌ (Change Column Width) instructions: ①·⑥, ②·③, ③·①⓪, ④·③, ⑤·①⓪, ⑥·③, ⑦·①⓪, ⑧·③, ⑨·①⓪.

2. In Column 1, enter the values of the radii. (ⒺⓃ command)

3. Using the ⒶⓋ command, assign the value of Pi, ③·①④①⑤⑨ to variable VP.

4. Press ⓑⓡⓔⓐⓚ to return to the worksheet. In Column 3, enter the formula: ②＊ⓋⓅ＊Ⓒ①. (ⒸⒻ command)

5. In Column 5, enter the formula: ⓋⓅ＊Ⓒ①＊Ⓒ①. (ⒸⒻ command)

6. In Column 7, enter the formula: (④／③)＊ⓋⓅ＊Ⓒ① ！③. (ⒸⒻ command)

7. In Column 9, enter the formula: ④＊ⓋⓅ＊Ⓒ①＊Ⓒ①. (ⒸⒻ command)

8. Use the ⒸⒶ command (Calculate) to see the computed values.

9. Move the marker to Cell 1,1 and insert three rows. (⟨I⟩⟨R⟩ command)

10. Enter the heading, ⟨R⟩⟨A⟩⟨D⟩⟨I⟩⟨U⟩⟨S⟩ in Cell 1,1. (⟨E⟩⟨T⟩ command)

11. Move the marker to Cell 1,3 and press the space bar three times before entering part of the heading, ⟨C⟩⟨I⟩⟨R⟩⟨C⟩⟨U⟩⟨M⟩⟨-⟩. Move the marker to Cell 2,3 and press the space bar three times. Enter the rest of the heading, ⟨F⟩⟨E⟩⟨R⟩⟨E⟩⟨N⟩⟨C⟩⟨E⟩. (⟨E⟩⟨T⟩ command)

12. Move the marker to Cell 1,5 and press the space bar three times before entering ⟨A⟩⟨R⟩⟨E⟩⟨A⟩ ⟨O⟩⟨F⟩. Move the marker to 2,5 and press the space bar four times, before entering the rest of the heading, ⟨C⟩⟨I⟩⟨R⟩⟨C⟩⟨L⟩⟨E⟩. (⟨E⟩⟨T⟩ command)

13. Move the marker to Cell 1,7 and press the space bar twice. Enter ⟨V⟩⟨O⟩⟨L⟩⟨U⟩⟨M⟩⟨E⟩ ⟨O⟩⟨F⟩ as part of the heading. Move the marker to Cell 2,7 and press the space bar five times. Enter ⟨S⟩⟨P⟩⟨H⟩⟨E⟩⟨R⟩⟨E⟩ as the rest of the heading. (⟨E⟩⟨T⟩ command)

14. Move the marker to Cell 1,9 and enter ⟨S⟩⟨U⟩⟨R⟩⟨F⟩⟨·⟩⟨A⟩⟨R⟩⟨E⟩⟨A⟩ as part of the heading. Move the marker to Cell 2,9 and press the space bar one time, before entering the words, ⟨O⟩⟨F⟩ ⟨S⟩⟨P⟩⟨H⟩⟨E⟩⟨R⟩⟨E⟩. (⟨E⟩⟨T⟩ command)

15. First, save the worksheet (⟨S⟩⟨A⟩ command). Move the entry marker to Cell 1,1 and insert two columns to center the worksheet before print ing. (⟨I⟩⟨C⟩ and ⟨L⟩⟨I⟩ commands) Later, you can overtype to enter new values for the radii. (⟨E⟩⟨N⟩ command) Spectaculator will use the formulas to recalculate and display the new values. (⟨C⟩⟨A⟩ command)

RADIUS	CIRCUM- FERENCE	AREA OF CIRCLE	VOLUME OF SPHERE	SURF. AREA OF SPHERE
1	6.28	3.14	4.19	12.57
5	31.42	78.54	523.60	314.16
7	43.98	153.94	1436.75	615.75
83	521.50	21642.41	2395093.75	86569.65
100	628.32	31415.90	4188786.65	125663.60

Personal Budget

The following example shows how to set up a simple home budget which compares the budgeted amounts for different expense categories with actual amounts spent. By using this general budget plan, you can easily see the areas where you are overspending. This example is stored on the Spectaculator disk under the file name, BUDGET1. Follow the steps below, using the data in the printout on page 38.

1. Enter the following ⒸⓌ (Change Column Width) instructions:
   ③·①⓪, ④·③, ⑤·①⓪, ⑥·①⓪, ⑦·①⓪.

2. Move the marker to Cell 3,3 and enter the word, ⒷⓊⒹⒼⒺⓉ. Move the marker to Cell 4,3 and enter the word, ⒸⒶⓉⒺⒼⓄⓇⒾⒺⓈ. (ⒺⓉ command)

3. Move the marker to Cell 3,5 and press the space bar twice. Enter the word, ⒷⓊⒹⒼⒺⓉⒺⒹ. Move the marker to Cell 4,5, press the space bar twice, and enter the word, ⒶⓂⓄⓊⓃⓉ. (ⒺⓉ command)

4. Move the marker to Cell 3,6 and press the space bar four times. Enter the word, ⒶⒸⓉⓊⒶⓁ. Move the marker to Cell 4,6, press the space bar four times and enter the word ⒶⓂⓄⓊⓃⓉ. (ⒺⓉ command)

5. Move the marker to Cell 3,7 and press the space bar four times. Enter the word ⓃⒺⓉ. Move the marker to Cell 4,7, press the space bar four times and enter the rest of the heading, ⒶⓂⓄⓊⓃⓉ. (ⒺⓉ command)

6. Move the marker to Cell 6,3 and enter the first budget category, ⒶⓊⓉⓄ. In Column 3, enter the rest of the categories. (ⒺⓉ command)

7. Move the marker to Cell 14,3 and enter the row heading, ⓉⓄⓉⒶⓁ. (ⒺⓉ command)

8. Move the marker to Cell 6,5 and enter the budgeted amount of the car payment, ①⑦⑤·⓪⓪ for the category, AUTO. In Column 5, enter the rest of the budgeted amounts. (ⒺⓃ command)

9. Move the marker to Cell 6,6 and enter the actual amount spent for the car payment, ①⑦⑤·⓪⓪, Enter the rest of the actual amounts in Column 6. (ⒺⓃ command)

10. Move the marker to Column 7 and enter the formula: Ⓒ⑤-Ⓒ⑥. (ⒸⒻ command)

Advanced Sessions (continued)

11. Move the marker to Row 14 and enter the formula: Ⓢ Ⓤ Ⓜ Ⓡ ⑥.
    (Ⓡ Ⓕ command)

12. Use the Ⓒ Ⓐ (Calculate) command to see the NET and TOTAL figures.

13. Move the marker to Cell 1,4 and enter the title, Ⓑ Ⓤ Ⓓ Ⓖ Ⓔ Ⓣ ␣
    Ⓕ Ⓞ Ⓡ ␣ Ⓜ Ⓐ Ⓡ Ⓒ Ⓗ ␣ ① ⑨ ⑧ ②. (Ⓔ Ⓣ command)

14. Print and save the worksheet. (Ⓛ Ⓘ and Ⓢ Ⓐ commands) At the end of
    April, you can enter the new figures for the month by overtyping the values
    for the ACTUAL AMOUNT in Column 6. (Ⓔ Ⓝ command) Spectaculator will
    recalculate and display the new NET and TOTAL figures. (Ⓒ Ⓐ command)
    Move the marker to Cell 1,4. Reenter the title and change the month.
    (Ⓔ Ⓣ command)

```
                    BUDGET FOR MARCH 1982

       BUDGET          BUDGETED       ACTUAL         NET
       CATEGORIES      AMOUNT         AMOUNT         AMOUNT

       AUTO             175.00        175.00            0.00
       CAR CARE          35.00        110.00          -75.00
       FOOD             150.00        125.00           25.00
       GAS               60.00         75.00          -15.00
       INSURANCE         15.00         15.00            0.00
       RECREATION        75.00        190.00         -115.00
       RENT             225.00        225.00            0.00

       TOTAL            735.00        915.00         -180.00
```

The following example shows how to set up an amortization schedule. The fixed monthly payment will be calculated and also broken down into its two components for each month: the interest and principal payments. Load BUDGET2 to see the finished worksheet for this example.

1. Enter the following (C)(W) (Change Column Width) instructions: (1)(·)(8), (2)(·)(9), (3)(·)(9), (4)(·)(1)(0), (5)(·)(1)(1), (6)(·)(1)(2), (7)(·)(1)(2).

2. At Cell 1,1, press the space bar twice and then enter the Column 1 heading, (P)(E)(R)(I)(O)(D). ((E)(T) command) ("Period" refers to a month.)

3. Type (1) and press (ENTER) in Cell 4,1. ((E)(N) command) Enter the rest of the periods (2–12) in Column 1. (This is a one-year loan.)

4. Type (A)(V) (Assign Variables) and press (ENTER). Move the entry marker to variable, VN. Enter (1)(2) for the number of periods.

5. Press (BREAK) to return to the worksheet. At Cell 1,2, press the space bar twice and then enter the Column 2 heading, (B)(A)(L)(A)(N)(C)(E). ((E)(T) command) In Cell 4,2, enter the original amount of the loan, (1)(0)(0)(0)(·)(0)(0). ((E)(N)command)

6. Assign the amount of (1)(0)(0)(0)(·)(0)(0) to variable, VP. ((A)(V) command) (The balance also equals the unpaid principal portion of the original loan amount.)

7. Press (BREAK) to return to the worksheet. At Cell 1,4, press the space bar twice and then enter (I)(N)(T)(E)(R)(E)(S)(T) as part of the Column 4 heading. At Cell 2,4 press the space bar three times and then enter the rest of the heading, (P)(A)(Y)(M)(E)(N)(T). ((E)(T) command)

8. Assign the interest rate (·)(0)(1)(5) (which is 18%/12) to variable, VI. ((A)(V) command)

9. Press (BREAK) to return to the worksheet. In Column 4, enter the formula: (C)(2)(*)(V)(I). ((C)(F) command) This formula will multiply the balance by the interest rate to give the interest portion of the payment.

10. At Cell 1,3, press the space bar twice and then enter the heading, (P)(A)(Y)(M)(E)(N)(T). ((E)(T) command)

11. Now enter the formula: (V)(P)(*)(V)(I)(/)(()(1)(-)(1)(/)(()(1)(+) (V)(I)())(!)(V)(N)()). ((C)(F) command) This is the formula normally used to give the fixed monthly payment of a loan.

12. At Cell 1,5, press the space bar twice and then enter PRINCIPAL as part of the heading. At Cell 2,5, press the space bar four times and enter the rest of the heading, PAYMENT. (ET command) The principal payment is the part of the total payment which actually goes to paying off the balance of the loan (the unpaid principal balance in Column 2).

13. Now enter the formula: C3-C4 .(CF command) This formula will subtract the interest payment from the total payment giving the principal payment.

14. At Cell 1,6, press the space bar twice and then enter CUMULATIVE as part of the heading. At Cell 2,6, press the space bar four times and enter the rest of the heading, INTEREST. (ET command)

15. Now enter the formula: SMTC4. This formula will give the interest paid-to-date. (CF command)

16. At Cell 1,7, press the space bar twice and then enter CUMULATIVE as part of the heading. At Cell 2,7 press the space bar three times and enter the rest of the heading, PRINCIPAL. (ET command)

17. Enter the formula: SMTC5. (CF command) This formula will give the principal paid-to-date. (After the entire table has been calculated, the last figure in this column will equal the amount of the original balance.)

18. Move the cursor to Column 2. To subtract the principal payment from the balance, you must first define the principal payment as one variable and the corresponding balance as another variable. Type AV (Assign Variables) and press ENTER. At the VA cell, type: R#C2 and press ENTER. At the VB cell, type: R#C5 and press ENTER.

19. Press BREAK to return to the worksheet, and enter the formula, VA-VB (CF command) in Column 2.

20. Now, type CA (Calculated) and press ENTER. All of the fixed payments in Column 3 are calculated and displayed. The other figures for the first period are also calculated. Note that there are two "extra" payments in Cells 2,3 and 3,3. To erase these numbers permanently, type ET (Enter Text command), press the space bar, and then press ENTER. Move the cursor to Cell 2,3, press the space bar once and then press ENTER. Repeat this process in Cell 3,3.

21. Repeat the CA command 11 times to calculate the figures for all 12 months.

22. Save and print the worksheet (⎡S⎤⎡A⎤ and ⎡L⎤⎡I⎤ commands.) Later, you can use the ⎡A⎤⎡V⎤ command and simply overtype to enter new values for the VN (number of periods), VI (interest rate), and VP (original amount of the loan) variables. (Remember that most interest rates are quoted in annual terms and must be divided by 12 to get the monthly interest payment.) Clear the calculated values in Columns 2-7 columns (⎡C⎤⎡C⎤ command) and repeat the Calculate command for each period.

PERIOD	BALANCE	PAYMENT	INTEREST PAYMENT	PRINCIPAL PAYMENT	CUMULATIVE INTEREST	CUMULATIVE PRINCIPAL
1	1000.00	91.68	15.00	76.68	15.00	76.68
2	923.32	91.68	13.85	77.83	28.85	154.51
3	845.49	91.68	12.68	79.00	41.53	233.51
4	766.49	91.68	11.50	80.18	53.03	313.69
5	686.31	91.68	10.29	81.39	63.32	395.08
6	604.92	91.68	9.07	82.61	72.39	477.69
7	522.31	91.68	7.83	83.85	80.22	561.54
8	438.46	91.68	6.58	85.10	86.80	646.64
9	353.36	91.68	5.30	86.38	92.10	733.02
10	266.98	91.68	4.00	87.68	96.10	820.70
11	179.30	91.68	2.69	88.99	98.79	909.69
12	90.31	91.68	1.35	90.33	100.14	1000.02

Statistics

To calculate the chi–square statistic, the following formula is used:

$$X^2 = \Sigma \; \frac{(OF-EF)^2}{EF}$$

where:

X^2 = Chi-square (chi is a Greek letter)
Σ = Symbol meaning "the sum of"
OF = An observed frequency
EF = An expected frequency

To produce the printout on page 43, follow the steps below using the data supplied in the printout on page 43. The finished worksheet for this example is stored on the Spectaculator disk under STAT1.

1. In Column 1, enter the observed frequencies. (ⒺⓃ command) These are the numbers in the OF column.

2. In Column 2, enter the expected frequencies. (ⒺⓃ command) These are the numbers in the EF column.

3. In Column 3, enter the formula: Ⓒ⒞①⊖Ⓒ②⊙＊⊙Ⓒ①⊖ Ⓒ②⊙. (ⒸⒻ command)

4. In Column 4, enter the formula: ⒹⒸ③⊘Ⓒ②. (Decimal ⒸⒻ command)

5. In Row 10, enter the formula: ⒹⓈⓊⓂⓇ①. (Decimal ⓇⒻ command)

6. Use the ⒸⒶ command to see the computed values.

7. Move the marker to Cell 1,1 and insert a column. (ⒾⒸ command)

8. Insert five rows. (ⒾⓇ command)

9. Enter the following ⒸⓌ (Change Column Width) instructions: ①·⑨, ②·①②, ③·①②, ④·①②, ⑤·①⑧.

10. Move the marker to Cell 1,3 (Row 1, Column 3) to enter the title of the table. Before typing the title, press the space bar seven times. Next, type: ⒸⒽⒾ·ⓈⓆⓊⒶⓇⒺ ⓈⓉⒶⓉⒾⓈⓉⒾⒸ and press ⒺⓃⓉⒺⓇ. (ⒺⓉ command)

11. Move the marker to Cell 4,2 and press the space bar ten times before entering the Column 2 heading, ⓄⒻ. (ⒺⓉ command)

12. Move the marker to Cell 4,3 and press the space bar ten times before entering the Column 3 heading, ⒺⒻ. (ⒺⓉ command)

13. Move the marker to Cell 4,4 and press the space bar four times before entering the Column 4 heading, ⟮ⓄⒻ⟯⟝ⒺⒻ⟯②. (ⒺⓉ command) This stands for the formula to subtract the Expected Frequency from the Observed Frequency, and then, to square the difference.

14. Move the marker to Cell 4,5 and press the space bar seven times before entering the Column 5 heading, ⟮ⓄⒻ⟝ⒺⒻ⟯②⟋ⒺⒻ. (ⒺⓉ command) This stands for the formula to divide the squared differences by the Expected Frequency.

15. To erase the unnecessary figures in Cells 15,2; 15,3; and 15,4, stay in the ET command. Move the marker to Cell 15,2, press the space bar once and press ⒺⓃⓉⒺⓇ. Repeat this process in Cells 15,3 and 15,4.

16. In Cell 15,4 enter the label, ⒸⒽⒾⒹⓈⓆⓊⒶⓇⒺ ⟵. (ⒺⓉ command)

17. After you print and save the worksheet (ⓁⒾ and ⓈⒶ commands), you can enter new values for the observed and expected frequencies in Columns 2 and 3. (ⒺⓃ command) Spectaculator will use the formulas which are still intact to recalculate and display the new values. (ⒸⒶ command)

```
          CHI-SQUARE  STATISTIC


    OF          EF       (OF-EF)2        (OF-EF)2/EF

    68          66         4.00            0.060606
    75          80        25.00            0.3125
    57          60         9.00            0.15
    79          73        36.00            0.493151
    32          34         4.00            0.117647
    45          40        25.00            0.6250
    33          30         9.00            0.30
    31          37        36.00            0.972973

              CHI-SQUARE  =               3.031877
```

The following formulas are used to calculate the mean, population variance, and the population standard deviation:

$$\mu = \frac{\Sigma x}{N} \qquad \theta^2 = \frac{\Sigma(x-\mu)^2}{N} \qquad \theta = \sqrt{\frac{\Sigma(x-\mu)^2}{N}}$$

where:

x = the observation
μ = the population mean
N = the total number of elements in the population
Σ = the symbol meaning the "sum of"
θ^2 = the population variance
θ = the population standard deviation

This table is on the Spectaculator disk under the file name, STAT2. To produce the printout on page 46, follow these steps, using the data supplied in the printout:

1. In Column 1, enter the observations. (E N command) These are the numbers in the (X) column.

2. Move the marker to Cell 17,1 and enter the formula: S U M R 1. This formula will total the values of all the observations in the population. (R F command)

3. Move the marker to Cell 18,1 and enter the formula: R 1 7 / 1 5. This formula will divide the total by the number of elements in the population, giving the mean. Later, after the formula in step 5 is entered, the population variance will be calculated. (R F command)

4. Using the A V command, assign the value of R 1 8 C 1 (the mean) to variable, VM.

5. Press BREAK to return to the worksheet and then move the marker to Cell 17,2. Enter the formula: (C 1 - V M) * (C 1 - V M). This formula will square the differences of the observations from the mean. The population variance and standard deviation will be figured, using this computed value. (C F command)

6. Move the marker to Cell 19,2 and enter the formula: S Q R R 1 8. This formula will take the square root of the average of the squared distances of the observations from the mean, giving the population standard deviation. (R F command)

7. Use the Calculate command to see the mean value. Repeat the `C` `A` command to see the variance and standard deviation.

8. To erase the unnecessary figure in Cell 19,1, type `E` `T` (Enter Text) and press `ENTER`. Move the marker to Cell 19,1, press the space bar once and press `ENTER`.

9. Insert two columns. (`I` `C` command)

10. Move the marker to Column 4 and insert two columns. (`I` `C` command)

11. Move the marker to Cell 1,1 and insert five rows. (`I` `R` command)

12. At Cell 1,1, press the space bar twice. Type: `M` `E` `A` `N` `·` `V` `A` `R` `I` `A` `N` `C` `E` `·` `A` `N` `D` `S` `T` `A` `N` `D` and press `ENTER`. Press `→` three times and the space bar once. Retype: `S` `T` `A` `N` `D` and then type the rest of the title, `A` `R` `D` `D` `E` `V` `I` `A` `T` `I` `O` `N`. Press `ENTER`. (`E` `T` command)

13. Move the marker to Cell 4,3 and press the space bar four times before entering the Column 3 heading, `(` `X` `)`. (`E` `T` command)

14. Move the marker to Cell 4,6 and press the space bar once, before entering the Column 6 heading, `(` `X` `-` `U` `)` `2`. (`E` `T` command)

15. Move the marker to Cell 22,1 and enter the Row 22 heading, `C` `O` `L` `U` `M` `N` `T` `O` `T` `A` `L` `=`. (`E` `T` command)

16. Move the marker to Cell 23,2 and press the space bar once, before entering the parameter label, `M` `E` `A` `N` `=` . (`E` `T` command)

17. Move the marker to Cell 23,4 and press the space bar four times, before entering the parameter label, `V` `A` `R` `I` `A` `N` `C` `E` `=`. (`E` `T` command)

18. Move the marker to Cell 24,4 and enter the parameter label, `S` `·` `D` `E` `V` `I` `A` `T` `I` `O` `N` `=`. (`E` `T` command)

19. Move the marker to Cell 1,1 and insert two columns. (`I` `C` command)

20. After you print and save the worksheet (`L` `I` and `S` `A` commands), you can enter different (X) values for the observations in Column 5. (`E` `N`

command) Next, erase the calculated values (C C command) in Columns 5 and 8 and then use the Calculate command two times.

```
          MEAN, VARIANCE, AND STANDARD DEVIATION


                        (X)                    (X-U)2

                         4                     158.76
                         6                     112.36
                        12                      21.16
                        14                       6.76
                        14                       6.76
                        15                       2.56
                        17                       0.16
                        17                       0.16
                        18                       1.96
                        19                       5.76
                        21                      19.36
                        21                      19.36
                        22                      29.16
                        24                      54.76
                        25                      70.56

     COLUMN TOTAL = 249.00                     509.60
             MEAN =  16.60      VARIANCE =      33.97
                            S. DEVIATION =       5.83
```

Part V—Key Summary

Key	Description
(?)	To see command set or specific command's HELP list. Type again to return to same command.
(BREAK)	To return to command mode. Stops printer.
(CLEAR)	Acts as a backspace key when entering commands, numbers, text, or formulas. Moves cursor left one character and erases previous character.
(SHIFT)(CLEAR)	Moves cursor to beginning of entry line and erases all characters, allowing you to reenter command, number, text, or formula.
(ENTER)	After typing command, number, text, or formula, computer executes command or "enters" information in worksheet. Erases previous entry if pressed at entry line.
(→)	Moves entry marker to the cell on the right. Does not erase data.
(←)	Moves entry marker to the cell on the left. Does not erase data.
(↑)	Moves entry marker up to the cell in the previous row. Does not erase data.
(↓)	Moves entry marker down to the cell in the next row. Does not erase data.
(B)(A)	BASIC—To exit the program and return to BASIC.
(M)(M)	Move Marker—To move entry marker to specific cell, enter Row No. and Column No. Press (ENTER) to move marker to "home" cell. Returns to command mode.
(E)(N)	Enter Number—Position marker and enter number. Limits: nine digits total with maximum of six digits to the right of the decimal point.
(C)(F)	Column Formula Entry—Position marker and enter formula. Operation symbols include: +, — and the nine operation symbols listed below Row Formula Entry. Can also include variables.

Key	Description
(R)(F)	Row Formula Entry—Position marker and enter formula. Can include all operation symbols used in Column Formula Entry as well as variables.
(*)	Operation symbol for multiplication.
(/)	Operation symbol for division.
( )( )	Operation symbol to indicate to perform the enclosed operation first.
(!)	Operation symbol to indicate exponents, e.g. 10⅓ would be 10!.3333.
(S)(Q)(R)	Operation symbol to indicate to take the square root of the number, column, or row following SQR.
(S)(U)(M)	Operation symbol to indicate to add the values starting from the column or row following SUM to the column or row where marker is positioned.
(S)(M)(T)	Operation symbol to indicate to give cumulative totals plus the final computed total of the row or column following SMT.
(I)	Operation symbol to indicate an integer calculated value which will display only the numbers to the left of the decimal. Type (I) before the formula.
(D)	Operation symbol to indicate a decimal calculated value carried out to six decimal places. Type (D) before the formula.
(A)(V)	Assign Variables—Position marker and enter value for variable. Can be a numeric value or a value of a particular worksheet cell. Numeric values can contain up to nine digits total with maximum of six digits to the right or the decimal point.
(#)	Symbol used to assign a variable to the value of a worksheet cell. Indicates to use the cell value of the column (or row) specified and the row (or column) before the row (or column) currently being calculated.

Key	Description
C A	Calculate—After calculated values are displayed, returns to command mode. Cannot use until formula has been entered.
C C	Clear Column—Position entry marker on desired column to erase all calculated values in that column. Cannot use until data has been entered. Stays in command mode.
C R	Clear Row—Position entry marker on desired row to erase all calculated values in that row. Cannot use until data has been entered. Stays in command mode.
E T	Enter Text—Position entry marker and enter text. Limit: 27 characters.
F R	Display Free Memory—To find out how much room in memory is left to enter data in worksheet. Stays in command mode.
Z W	Zap Worksheet—Clears current worksheet from the screen and memory. Stays in command mode.
D R	Delete Row—Position entry marker on desired row to erase numbers, text and formulas in that row. Other formulas change to reflect deletion. Cannot use until data has been entered. Stays in command mode.
D C	Delete Column—Position entry marker on desired column to erase numbers, text, and formulas in that column. Other formulas change to reflect deletion. Cannot use until data has been entered. Stays in command mode.
I R	Insert Row—Position entry marker on desired row where you want to enter new data. Data and formula previously in that row shift downward. Other formulas change to reflect insertion. Cannot use until data has been entered. Stays in command mode.
I C	Insert Column—Position entry marker on desired column where you want to enter new data. Data and formula previously in that column shift to the right. Other formulas change to reflect insertion. Cannot use until data has been entered. Stays in command mode.
C W	Change Column Width—To change column width, enter Column No. and width. Type A L L to change width of all columns.

Key Summary (continued)

Key	Description
(S)(A)	Save on Disk—Type file name (up to eight characters) and press (ENTER). Returns to command mode.
(P)(S)	Partial Save—Position entry marker on first cell to be saved, then enter Row No., Column No. of last cell to be saved, file name (up to eight characters). Returns to command mode.
(L)(O)	Load from Disk—Type file name and press (ENTER). Worksheet file appears on screen. Returns to command mode.
(L)(I)	List to Printer—To print entire worksheet, position entry marker on Cell 1,1 and press (ENTER). To print part of worksheet, position entry marker on first cell to be printed, then enter Row No., Column No. of last cell to be printed.

Single–Drive Systems

Making a Backup consists of two processes. These processes are: Format (or prepare) the disk for information storage, and Backup (or copy) all the information from the original disk to the new, formatted disk. Here is the step-by-step Backup procedure:

1. Turn on the TV, computer and disk drives, in that order. The copyright message:

   > DISK EXTENDED COLOR BASIC v.r.
   > COPYRIGHT (C) 1981 BY TANDY
   > UNDER LICENSE FROM MICROSOFT
   >
   > OK

   should appear on your screen. (v.r. is two numbers specifying which version and which release you have.) If you do not see this message, turn off the computer. Check your connections and power up again.

2. Open the Drive 0 door by pressing the release switch down. Insert a blank disk in the drive with the notch on top. You will feel the disk click in place. Close the drive door firmly.

3. Next, to format the disk, type: `D S K I N I 0` and pess `ENTER`. The Format process will take about 40 seconds. After the disk is formatted, the red light on the drive door will go off and the message OK will appear on the screen.

4. To backup the program disk, first remove the formatted disk. Press the release switch to open the drive door and gently remove the disk. Insert the Spectaculator disk in Drive 0 and close the drive door. Now type: `B A C K U P 0` and press `ENTER`. The computer will tell you to insert the Destination diskette. Insert the new disk you just formatted close the drive door and press `ENTER`. The computer will tell you to insert the Source diskette or Destination disk several times until the Backup process has been completed. (The entire Backup process will take about five minutes.) After the Backup is finished, the OK message will reappear.

5. To make sure the Backup was successful, type ⒟ⒾⓇ and press
ⒺⓃⓉⒺⓇ. You should see:

```
DOS        BIN   2   B   2
SPEC       BIN   2   B   4
HELPFILE   BIN   2   B   2
DOS        BAS   0   B   1
GEOMETRY   SPC   6   A   1
BUDGET1    SPC   6   A   1
BUDGET2    SPC   6   A   1
STAT1      SPC   6   A   1
STAT2      SPC   6   A   1
OK
```

(Later, after you have saved files on the Backup copy, these files will also be listed in the Directory with a SPC extension. The numbers in the last column on the right may vary.) Label the new disk and its protective sleeve Spectaculator (and list any additional files you have created). Store the original Spectaculator disk in its protective sleeve and keep it in a safe place.

Multi–Drive System

Making a Backup consists of two processes. These processes are: Format (or prepare) the disk for information storage, and Backup (or copy) all the information from the original disk to the new, formatted disk. Here is the step-by-step Backup procedure:

1. Turn on the TV, computer and disk drives, in that order. The copyright message:

> DISK EXTENDED COLOR BASIC v.r.
> COPYRIGHT (C) 1981 BY TANDY
> UNDER LICENSE FROM MICROSOFT
>
> OK

should appear on your screen. (v.r. is two numbers specifying which version and which release you have.) If you do not see this message, turn off the computer. Check your connections and power up again.

2. Open the Drive 0 door by pressing the release switch down. Insert the Spectaculator disk in Drive 0 with the notch on top. You will feel the disk click in place. Close the drive door. Insert a blank disk in Drive 1 in the exact same manner.

3. Next, to format the disk in Drive 1, type: [D][S][K][I][N][I][1] and press [ENTER]. The Format process will take about 40 seconds. After the disk is formatted, the red light on the drive door will go off and the message OK will appear on the screen.

If you just need a new, formatted disk on which to save files, you are finished at this point. To copy the Spectaculator program disk, or to copy existing files from a data disk, continue with the instructions.

4. Type: [B][A][C][K][U][P][0][T O][1] and press [ENTER]. The Backup process will take about two minutes. As the information from the Spectaculator disk is being transferred to the newly-formatted disk in Drive 1, the red light on both drive doors will flash on and off. After the Backup is finished, the red lights on both drive doors will go off and the message OK will appear on the screen.

5. To make sure the Backup was successful, remove the Spectaculator disk from Drive Ø and place it in its protective sleeve. Keep the original Spectaculator disk in a safe place. Take the Backup copy out of Drive 1 and insert it in Drive Ø. Close the drive door. Type ⒹⒾⓇ and press ⒺⓃⓉⒺⓇ. You should see:

```
DOS        BIN   2   B   2
SPEC       BIN   2   B   4
HELPFILE   BIN   2   B   2
DOS        BAS   Ø   B   1
GEOMETRY   SPC   6   A   1
BUDGET1    SPC   6   A   1
BUDGET2    SPC   6   A   1
STAT1      SPC   6   A   1
STAT2      SPC   6   A   1
OK
```

(Later, after you have saved files on the Backup copy, these files will also be listed in the Directory with a SPC extension. The numbers in the last column on the right may vary.) Label the new disk and its protective sleeve Spectaculator (and list any additional files you have created).